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CONTACT DUPLICATING & RESEAU PRINTER

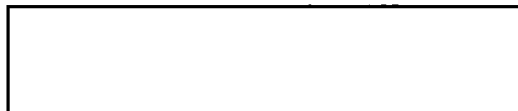
AND

HIGH RESOLUTION STEP & REPEAT PRINTER

Second Monthly Letter Report

September 10, 1964

Period: August 1, 1964 to September 1, 1964



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NGA Review
Complete

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1.0 CONTACT DUPLICATING AND RESEAU PRINTER

1.1 Purpose

The purpose of this effort is to design, fabricate, test and deliver in fifteen months a high-speed, maximum resolution, minimum distortion, Step and Repeat Duplicating and Reseau Printer. Results of the initial feasibility study will lead to a Design Plan, followed by fabrication, test and delivery of the final Printer. The deliverable equipment will be suitable for operational use. It will accommodate films of 70 mm to 9 1/2" in width with format lengths up to 30", and offer operation in the Reseau mode as an option.

1.2 Activity of this Report Period

The primary effort of this report period was the preparation of the Design Analysis Report in accordance with the description and schedule stipulated in the contract.

Contained in the Design Analysis Report is a detailed discussion and analysis of the anticipated problem areas, the component characteristics and general design configurations. The report will be submitted immediately following submission of this Monthly Report.

1.2.1 Program Organization

An engineering task force has been established to accomplish program objectives, and specific tasks have been assigned to appropriate personnel.

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In accordance with [] a subcontract has been negotiated with the [] of [] for the basic design and fabrication of the Printer. The subcontract has been submitted to the Contracting Officer for approval.

A preliminary PERT chart has been developed based on machine delivery goal by October 1, 1965.

1.3 Plans for Next Report Period

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During September, the current supporting research activity will continue at [] in all the critical problem areas described in the Design Analysis Report. Concurrently, the subcontractor, [] will finish construction of the breadboard test-bed and begin fabrication and evaluation of film-drive systems, light sources, exposure controls, film-metering devices and means for achieving optimum contact-printing pressure.

1.4 Problems

No major problems appeared during August which might be expected to cause program delays. No major problems are forecast for September.

1.5 Documentation

The following is a summary of agreements made with the Technical Monitors during the Design Review Meeting of August 13, 1964:

1.5.1 Previewer field of view can be reduced if higher magnification is required. Possible use of two magnification ranges may be advantageous. Since alignment of punch to presently known fiducials to within five microns may not be feasible, a grid on separate film will be supplied by the monitors to demonstrate accuracy of punch alignment. Alignment to diametrically opposed fiducials would result in optimum alignment.

1.5.2 In purchase description, accuracy of alignment to within two microns may be interpreted as plus or minus two microns.

1.5.3 Type of fiducial marking will vary on rolls of film.

1.5.4 Use of single resolution target used in multiple positions rather than a single format will be acceptable. A half-tone screen to check on contact pressure will be satisfactory. The Government has a 228-lp/mm target array which may be used for supplemental testing.

1.5.5 Frame coding location is not consistent within the various formats considered. Masking must not obliterate frame numbers.

1.5.6 Monitors do not foresee need for 1000' rolls of 9" film -- 500' appears to be maximum.

1.5.7 Photoelectric sensing of frame ends for positioning will be no problem. Skipped frames due to indefinite edges may be picked up later.

1.5.8 Masking is desirable to maintain sharp edges of format and prevent stray light along borders.

1.5.9 70 mm film will definitely be required even though this is a small size for a large printer. Minimum frame length will be 2-1/4".

1.5.10 Only negatives to be Reseau printed can be punched.

1.5.11 Monitors do not presently use any film with anti-halation backing (AHU) and sensing through the film is acceptable, if it does not adversely affect other machine characteristics.

1.5.12 Monitors are not concerned with loss of a picture if a splice is detected on the frame. Raw stock film is not expected to contain splices.

1.5.13 Method for determining uniformity of light intensity over exposure area will be determined after finalizing light source and optics. Determination can be photometric at the platen.

1.5.14 An answer to RFI testing is deferred to a later date.

1.5.15 A capability in Automatic Exposure Control of a shift in density of plus or minus one density unit from the original density has been suggested as a criterion for design.

1.5.16 Emulsion-to-emulsion printing as well as printing through the film base will be required. In some cases distinct Reseau lines are more important than distinct images, in which case the emulsion would face the Reseau.

1.5.17 Calibrating the Reseau grid will be useless if line spacing varies due to light source or due to various film bases. Any calibration curves must factor in operating conditions and film types.

1.5.18 The following items have been requested of the Technical Monitors as soon as possible:

(1) Procurement of a list of approved RFI components which may be obtained from the Signal Corps Procurement Agency, 2800 South 20th St., Philadelphia 45, Pennsylvania.

(2) Publication from Chicago Industrial Television Company concerning a study of clean-room environment.

(3) Publication made STAT for W.A.D.C. on high-resolution printing.

(4) Samples of "typical" aerial negatives to illustrate high and low densities, fiducial markings, skewness, coding, border sizes, frame edges, etc.

(5) List of frame sizes anticipated for Printer for each width of film to be utilized.

2.0 HIGH RESOLUTION STEP AND REPEAT PRINTER

2.1 Purpose

The purpose of this effort is to design, fabricate, test and deliver in twenty months a high-precision, Step and Repeat Photographic Contact Printer. This printer will be capable of producing photographic contact prints of the highest possible quality, resolution and acutance from roll films of widths varying from 70 mm to 9 1/2" and in pre-selected frame lengths from 2 1/4" up to a maximum of 30".

The program will include a six-month Feasibility Study and Design Analysis, followed by a Breadboard Phase. Following design approval, a Prototype printer will be produced in accordance with the design plan.

2.2 Activity of this Report Period

2.2.1 Human Factors

A list of prime objectives has been prepared and various sketches made of machine configuration for presentation material. A meeting with industrial design consultants,

has been scheduled for September 2, 1964.

2.2.2 RFI and Power Distribution

An Interference Control Plan has been prepared. Selection of shielded components is in progress. Techniques of circuit suppression and RFI level prediction is under investigation.

2.2.3 Film Coding

Preliminary coding technique study is in progress based upon machine readout requirements.

Electronic logic methods are under analysis in accordance with requirements of the printer control system.

2.2.4 Control Panel

Basic control parameters have been established. Component selection and configuration is being studied in conjunction with the RFI and Human Factors studies.

2.2.5 Film Gate

Master targets upwards of 566 lines per millimeter have been prepared. A final test run on 4404 film is in process for use as a master negative in the Newton Fringe Study. This will include 122 USAF targets at 200X reduction, a 300 line/inch halftone pattern and 3 step tablets. Dry gate tests of over 400 lines/millimeter have been performed.

2.2.6 Exposure Control & Dodging

A preliminary report has been completed presenting quantitative data for defining material parameter specifications, tone reproduction, resolving power, over and under exposure

and contrast. A systematic approach to exposure control was examined and a sensitometric exposure example was provided. The data is under analysis and will be presented at the next design review meeting.

2.2.7 Film Handling

Analysis of film wrap tension has been calculated. Bending stresses caused by reeling are being studied with regard to their effect on film curl and other film distortion. Literature and patent search is in progress. Various film sizes and materials have been ordered for laboratory experiment. Various mechanism designs have been sketched and analyzed.

2.2.8 Reliability

Reliability work-charts are being prepared for each project task and will help to provide failure analysis in the form of failure by rank and probability of occurrence.

2.2.9 PERT

The Program PERT chart has been expanded to include all three project phases. Initially, analysis and updating will be on a weekly basis.

2.2.10 A preliminary list of probable mock-ups required in first phase study has been prepared.

2.3 Plans for Next Report Period

2.3.1 Continue feasibility study research and task analysis.

2.3.2 Complete presentation material for delivery to customer.

2.3.3 Arrange for meetings to discuss film coding requirements.

2.4 Problems

2.4.1 Speed-up of project personnel clearances is required to prevent possible program delay.

2.5 Documentation

As a result of the design review meeting held with the Technical Monitor, the following agreements were made:

2.5.1 Film Coding Considerations

(1) A single border-edge along the length of the film will always be clean and available for coding; however, the choice of which border is available along the film length is a variable.

(2) Coding system should be preferably human readable as well as machine readable.

- (3) Coding method cannot indent or damage film in any way.
- (4) Coding should be permanent.
- (5) Code cannot be put between frames because some negatives may contain strip photography and will have to be artificially split up.
- (6) The possibility of edge coding (along the 2.5 to 7.5 mil edge) should be considered.
- (7) Monitor recommends consideration of ultrasonic techniques for coding.
- (8) Monitor proposes a meeting be held in Washington soon with our technical representatives present to resolve the problem of coding compatibility with existing codes in archival films.
- (9) Monitor will determine the possibility of applying film code to archival films and new films.

2.5.2 Masking and Transport

- (1) Masks along the width of the film may be eliminated in order to assure the printing of all data on the film.

- (2) Masks along the length of the film are only for prevention of fogging, not for aesthetic purposes.
- (3) There are discrete frame sizes. Frame sizes will vary from roll to roll and possibly within the same roll. Coding will determine the stopping point for locating the frames in strip photography.
- (4) Masks may be manually adjusted (automatic feature is not required).
- (5) The operator should have the capability of removing partially exposed roll of dupe film in the dark by cutting (safelights will be used).
- (6) 1000' roll capability will be definitely required for raw stock.
- (7) The maximum negative film length will probably be 500'.

2.5.3 Reaction to Machine Sketch

- (1) Try to limit machine size to 5' x 7' x 2.5' if at all possible.
- (2) The control panel as shown may make access to the film area difficult. Panel recessing should be considered if possible.

(3) Presentation material is desired by October 1, 1964.

2.5.4 RFI Testing

Monitor will defer decision on RFI testing until later.

Printer must be designed for RFI suppression. ☐ requests STAT characteristics of associated equipment that may be RFI sensitive to our machine.

2.5.5 Exposure Control, Dodging, Gate

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- (1) Further discussions to clarify requirements of automatic dodging and exposure control systems have been proposed.
 - (2) Printer will handle high and low altitude films.
 - (3) No ☐ type cleaner is desired in the machine. Preferably vacuum cleaning of the raw film may be required.
 - (4) The Technical Monitor indicates it would be preferred if resolution can be achieved in the printer without liquid gate.

2.5.6 Questions Outstanding

- (1) List of spool sizes to be furnished by the monitor.
- (2) Document procurement to be furnished by the monitor.

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